

HEIGHT MODERNIZATION



How Can NOAA's Height Modernization Program Benefit Floodplain Mapping?

National Oceanic and Atmospheric Administration
National Ocean Service

Heights (Elevations) are used in:

- Flood Insurance Rate Maps (FIRM) Modernization
- Determining High Water Marks
- Elevation Certificates
- Dam Safety
- Mitigation

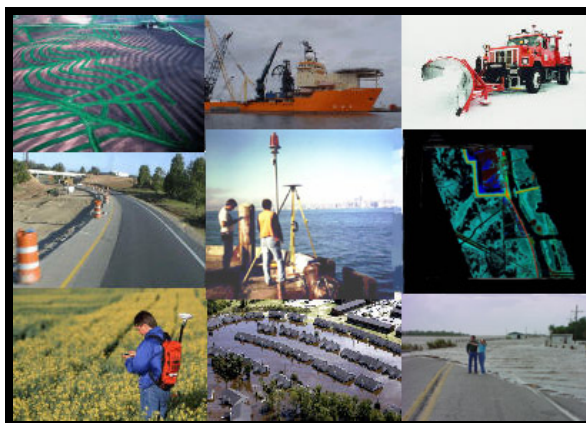
Benefits to FEMA and Floodplain Managers:

- Three-dimensional geodetic control network to support Map Modernization
- Establishment of bench marks in remote areas (2 centimeters)
- Global Positioning System (GPS) base station network to support collection of elevations and imagery (LIDAR and photogrammetry)
- GPS heights can be established at a reduced cost
- Quickly established bench marks in declared disaster areas to support recovery and mitigation
- Development of flood warning systems
- Elevation data to support dam breach analysis

With Height Modernization, the overall cost of establishing and updating elevations is lower, while the data reliability and quality assurance are higher.

Potential NOAA Products and Tools for Map Modernization:

- Height Modernization control for floodplain maps and LIDAR surveys
- Web-based positioning using OPUS for elevation certificates and LIDAR surveys
- Subsidence rates, maps, and tools for floodplain managers
- Guidelines for use of GPS and LIDAR for floodplain mapping



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ACCURATE, RELIABLE ELEVATIONS AND MAPS

On September 15, 1999, **Hurricane Floyd** dropped 21 inches of rain on **North Carolina**, damaging over 67,000 homes and destroying nearly 8,000 homes. Many of the homeowners did not have flood insurance, because the houses were not built on land that had been designated as flood prone on the **Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs)**.



The state of **North Carolina** began working with FEMA and other agencies to update the outdated FIRMs quickly. On September 15, 2000, one year after Hurricane Floyd, North Carolina became the first **Cooperating Technical State (CTS)**. As a CTS, North Carolina assumed primary ownership and responsibility for the production and maintenance of new

digital FIRMs. North Carolina developed the **North Carolina Floodplain Mapping Program**, which uses **Height Modernization** to gather elevation data and update their vertical positions. New elevation data help evaluate and improve the accuracy of the floodplain maps. With North Carolina's vulnerability to hurricanes and flooding, communities and property owners need to have accurate, up-to-date information about flood risks.

Height Modernization is the establishment of accurate, reliable heights using GPS technology in conjunction with traditional leveling, gravity, and modern remote sensing information.

SAVE TIME AND MONEY

Height Modernization is a cost efficient way to update or establish accurate elevations. Using GPS in conjunction with existing survey information and modern technology **can result in savings from 25 to 90 percent, depending on the type of survey conducted**. Through collaboration between NGS and other federal, state, local, and private sector partners, **Height Modernization** measures and delivers more accurate

heights to spatial data users – on land, at sea, and in the air.



The cost of inadequate flood mapping is great. **The recovery cost from Hurricane Floyd is estimated at \$6 billion.** FEMA estimates that each year one billion dollars of future property damage could have been avoided in North Carolina if accurate flood hazard maps were updated and available. A **Benefit Cost Analysis of the North Carolina Flood Map Modernization Program** conducted by the **U.S. Geological Survey** conservatively estimates a 3.35:1 return on investment. It is also estimated that the long-term benefits of map updates are reduced by \$57 million for each year that the map updating is delayed.

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